Exhibit 69

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African-Americans and Hispanics remain at lower risk of ovarian cancer than non-Hispanic Whites after considering non-genetic risk factors and oophorectomy rates

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Abstract

Background—Risk factors for invasive epithelial ovarian cancer (IEOC) among Hispanics and African Americans are under-studied despite notable differences in incidence relative to non-Hispanic Whites.

Methods—We used multivariate logistic regression to examine parity, oral contraceptive use, tubal ligation, endometriosis, family history of ovarian cancer, and talc use and risk of IEOC among Hispanics (308 cases, 380 controls), African Americans (128 cases, 143 controls) and non-Hispanic Whites (1265 cases, 1868 controls) using four case-control studies we conducted in Los Angeles County. We expressed each of these factors in the form of increasing risk and calculated population attributable risk percentage (PAR%) estimates for the six risk factors separately and jointly in the three groups.

Results—The risk associations with these six well-accepted factors were comparable in the three groups. The significant racial/ethnic differences in the prevalence of these factors and differences in their oophorectomy rates explained 31% of the lower incidence in African Americans compared to non-Hispanic Whites, but only 13% of the lower incidence in Hispanics. The PAR%s ranged from 27.5% to 31.0% for no tubal ligation, 15.9% to 22.2% for not using oral contraceptives, and 12.2% to 15.1% for using talc in the three groups.

Conclusions—All six risk factors are comparably important in the three groups. Differences in the prevalence of these factors and their oophorectomy rates explained approximately one-third of the difference in incidence between African Americans and non-Hispanic Whites.

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Impact—Devising strategies to lessen the burden of IEOC will be applicable to all three racial/ethnic groups.

Keywords

ovarian cancer; population attributable risk percentages; ethnicity

Introduction

In the US in the period 2000–2009, the annual age-adjusted incidence rate of invasive epithelial ovarian cancer (IEOC) was highest in non-Hispanic Whites (14.3 per 100,000), intermediate in Hispanics (12.1 per 100,000; 15% lower than the rate in non-Hispanic Whites) and lowest in African Americans (10.2 per 100,000; 29% lower than the rate in non-Hispanic Whites) (1). Epidemiologic studies of ovarian cancer risk have focused primarily on non-Hispanic White women; reasons for the racial/ethnic differences in incidence are not well understood.

A number of risk factors –first degree family history of ovarian cancer, endometriosis, and use of talc – and protective factors – parity, use of oral contraceptives, and tubal ligation – have been unequivocally associated with ovarian cancer in non-Hispanic Whites. There is virtually no information on ovarian cancer risk factors in Hispanics. A small number of Hispanic cases (n=42) were included in an ovarian cancer case-control study conducted in the Central Valley of California, but only results on talc use were reported separately in Hispanics (35.7% in cases vs 26.9% in controls) (2). A hospital-based case-control study in Mexico compared risk factors between 84 ovarian cancer cases and control women selected from an outpatient clinic (3): parity and use of oral contraceptives were significantly inversely associated with risk but information on other factors has not been presented.

Risk factors for ovarian cancer among African Americans have been examined in three reports (4–6). The Collaborative Analysis of US Case-Control Studies of Ovarian Cancer included seven studies with a total of 110 ovarian cancers (72 invasive, 35 borderline, 3 unknown) in African-American women (4). Ness and colleagues reported on risk of ovarian cancer among 84 African-American women with invasive or borderline cancers (numbers of each not specified) from their Delaware Valley case-control study (5). More recently, Moorman and colleagues reported results from 111 African Americans with invasive ovarian cancer from their North Carolina ovarian cancer case-control study (6). Reduced risk from increased parity and oral contraceptive use were found in all three studies. Tubal ligation was found to be significantly inversely associated with risk in both of the studies that reported on this factor (5, 6). The results regarding family history are unclear. John and colleagues did not report on family history (4). Ness and colleagues found that a family history of ovarian cancer was inversely associated with risk in African Americans but this was based on sparse numbers (1.2% of cases vs 2.0% of controls), a finding contrary to the strong increased risk found in non-Hispanic Whites (4.6% of cases vs 1.9% of controls)(5). Family history of ovarian cancer was not reported in the North Carolina study but family history of breast or ovarian cancer was a significant risk factor for African Americans (6).

The literature on causes of IEOC in Hispanics and African Americans is therefore very limited and it remains unclear to what extent the differences in the prevalence of ovarian cancer risk factors explain the differences in incidence between these three racial/ethnic groups. During the period 1992–2008, we conducted four IEOC case-control studies in Los Angeles County designed to elucidate risk factors for the disease and to evaluate differences in risk across non-Hispanic Whites, Hispanics, and African Americans.

Materials and Methods

The results presented here are based on pooling the questionnaire data from these four studies which used identical data collection methods as regards the factors discussed here; comprehensive details of these methods have been published (7–9). These studies were approved by the University of Southern California Institutional Review Board, and written informed consent was obtained from each patient and control before her interview.

Case Ascertainment

For all studies, newly diagnosed histologically confirmed IEOC cases were identified from the USC Cancer Surveillance Program which is the Los Angeles County SEER Program. Eligible patients were female residents of Los Angeles County of self-reported non-Hispanic White, Hispanic, or African- American race/ethnicity. Cases were eligible for inclusion in the study if they were between 18 and 74 years of age at diagnosis (up to age 79 for cases diagnosed between 2003 and 2008). A total of 3,370 patients met the study criteria (2,580 non-Hispanic Whites, 506 Hispanics, 284 African Americans). Overall, 15.7% of patients (17.2% non-Hispanic Whites, 8.5% Hispanics, 15.5% African Americans) declined to be interviewed, 16.9% had died or were too ill to be interviewed (17.8% non-Hispanic Whites, 12.1% Hispanics, 17.6% African Americans), and 11.4% could not be located or had moved out of Los Angeles County (10.2% non-Hispanic Whites, 14.0% Hispanics, 17.6% African Americans). We were thus able to carry out in-person interviews with 1,886 patients (1,415 non-Hispanic Whites, 331 Hispanics, and 140 African Americans), representing 63.2% participation rate of the patients approached (61.1% non-Hispanic Whites, 76.1% Hispanics, and 59.8% African Americans). The response rate was higher for patients diagnosed with localized cancer (69%) compared to those with more advanced stage at diagnosis (61%). Response rates were highest for those diagnosed under age 60 (70%), intermediate for those ages 60–69 (59%), and lowest for those ages 70+ (47%) at diagnosis. In this analysis, we excluded 185 patients who had a previous cancer (excluding non-melanoma skin cancer) or had prior bilateral oophorectomy and the final analysis was based on 1,701 patients (1,265 non-Hispanic Whites, 308 Hispanics, and 128 African Americans).

Control Ascertainment

Controls were residents of Los Angeles County with at least one intact ovary identified using a well-tested neighborhood control selection algorithm (8–10). Neighborhood controls were individually matched to cases on race/ethnicity and year of birth (+/− 5 years); they represented essentially all the controls interviewed. In one study, selection of controls for cases >65 years of age was augmented, if necessary, by using lists of female residents of Los Angeles County provided by the Health Care Financing Administration, matched to the case

on zip code, race/ethnicity, and year of birth closest to the case's year of birth (8). Overall, 70% of the non-Hispanic White, Hispanic, and African-American controls interviewed were the first identified control.

Data Collection

In-person interviews were conducted using standardized questionnaires which included the use of a life calendar. The core questions on the risk factors presented here were identical in the four studies. The questionnaire covered events up to 12 months before a case's diagnosis date and a similar reference date for the controls.

The demographic, lifestyle, and medical history variables considered in this analysis include race/ethnicity (African American, Hispanic, non-Hispanic White), age at diagnosis, parity, oral contraceptive use, tubal ligation, self-reported physician-diagnosed endometriosis, first degree family history of ovarian cancer, and genital talc use.

Statistical Analysis

We employed standard statistical methods including multivariate logistic regression using the statistical package programs STATA 12 (StataCorp, College Station, TX) and SAS 9.2 (SAS Institute Inc., Cary, NC). Although the studies were designed as matched case-control studies, at the termination of the particular studies, some cases had not been matched to a control and there were some controls whose cases had to be excluded after they completed the interview, because they were ineligible for the current analysis (*e.g.*, not IEOC or did not live in Los Angeles County at the time of diagnosis). In this report we have used all interviewed cases and controls by adopting a stratified multivariate logistic regression analysis approach with joint stratification for the three race/ethnicity groups, age group (<30, five year age groups to age 79), interviewer, and study. Analysis focused on the following factors: nulliparity (yes/no), oral contraceptive use (yes/no; no included never and <1 year of use), tubal ligation (yes/no), history of endometriosis (yes/no), family history of ovarian cancer (mother or sister; yes/no), and history of genital talc use (yes/no; no included never and <1 year of use). The logistic regression analysis also adjusted for menopausal status (premenopausal, natural menopause age ≤49, natural menopause age 50–54, natural menopause ≥55, surgical menopause (simple hysterectomy only) age ≤49, surgical menopause ≥50, other), age at menarche (≤11, 12, 13, ≥14), hormone therapy use (none, former or current estrogen + progestin, former or current estrogen alone), body mass index (BMI; kg/m^2) (≤22, >22–24, >24–28, >28), family income (≤40,000, >40,000 to ≤64,000, >64,000 to ≤100,000, >100,000, don't know) and education (high school or less, some college, college or higher). Odds ratios (ORs) – and corresponding 95% confidence intervals (CIs) – were calculated as estimates of the relative risks (RRs). All statistical significance values (P values) quoted are two-sided.

Population attributable risk percentages (PAR%s), defined as the percentages of disease in the population that are attributable to a given risk factor (or set of risk factors), were calculated using the method of Bruzzi *et al*. (11). These authors showed that PAR%s could be calculated from a case-control study using the estimated RRs applied to the cases only. This approach is of particular value to our analysis as it only requires the cases to be a

representative sample from the population at risk. This method uses the individual data on each case to calculate the expected fraction of the cases that would not have occurred if the risk factors being considered were at their baseline values, and this fraction was then used to calculate the PAR%. For a single risk factor the confidence limit for the PAR% was obtained by repeating the calculation using the lower (and upper) confidence bound of the OR for the particular factor in this calculation. For multiple risk factors, the confidence bounds for the PAR% were obtained by simulation: drawing repeated random samples from the mean and covariance matrix of the log ORs from the logistic regression fit and calculating a PAR% from that sample – the 95% confidence bounds were taken as the 2.5% and 97.5% values from the repeated samples. In our simulation analyses we used 5,000 repeats.

Published incidence rates for IEOC make no adjustment for the number of women who have had their ovaries (and fallopian tubes) removed. Writing *h* for the proportion of women who have had a hysterectomy and *t* for the proportion of hysterectomies that include removal of the ovaries (oophorectomy), an incidence rate *r* is approximately adjusted (not accounting for age at oophorectomy) for the oophorectomy rate as follows:

$$r_{\mathrm{adj-ooph}} = r/(1 - h \times t) \quad \text{Formula (A)}$$

If a population incidence rate (or an oophorectomy adjusted incidence rate) *r* is associated with a PAR% *p* for a single risk factor (or a group of risk factors) then the expected incidence rate if the population was at the baseline risk of the risk factor is:

$$r_{\mathrm{adj-PAR\%}} = r \times (1 - \mathrm{p}/100) \quad \text{Formula (B)}$$

Results

This analysis was based on 1701 women diagnosed with IEOC (1265 non-Hispanic Whites, 308 Hispanics, and 128 African Americans) and 2391 control women (1868 non-Hispanic Whites, 380 Hispanics, and 143 African Americans). The distribution of IEOC by histology, stage at diagnosis and differentiation did not differ significantly between the three groups (Table 1). The majority of IEOC in the three racial/ethnic groups was of serous cell type, distant stage at diagnosis, and poorly differentiated.

The prevalence of the risk factors including the average number of births, duration of oral contraceptive use, and duration of talc use in the three groups of controls and cases are shown in Table 2. All six factors are presented in the manner of being associated with increasing risk; *i.e.*, the factors that are inversely associated with risk are presented in the form of their absence being a risk factor, *e.g.*, the decreased risk in parous women is presented as a risk in nulliparous women. This was done to allow the presentation of PAR %s in a standard fashion.

With the exception of family history of ovarian cancer, the prevalence of the other risk factors differed significantly between the three racial/ethnic groups of control women (Table

2, top). The prevalence of no tubal ligation was 69.2% in African-American, 73.7% in Hispanic, and 85.9% in non-Hispanic White control women (P_{2df} <0.0001). Nulliparity and history of endometriosis was highest in non-Hispanic Whites, intermediate in African Americans, and lowest in Hispanics (23.7%, 16.8% and 13.7% for nulliparity, P_{2df} <0.001; 7.5%, 5.6% and 3.4% for endometriosis, P_{2df} =0.008). No oral contraceptive use (no/<1 year) was highest in Hispanics (54.7%), followed by African Americans (47.6%), and lowest in non-Hispanic Whites (41.5%) (P_{2df} <0.001). Talc use was more common in African-American women (44.1%) than in non-Hispanic Whites (30.4%) or Hispanics (28.9%) (P_{2df} =0.001). Similar patterns of differences in these risk factors between the three racial/ethnic groups of IEOC patients were found (Table 2, bottom).

As expected, each of the six risk factors had statistically significant independent effects on risk in non-Hispanic Whites. Risk patterns in Hispanics paralleled those in non-Hispanic Whites (Table 3), although the elevated risks with endometriosis and family history of ovarian cancer did not achieve statistical significance. In African Americans, family history of ovarian cancer was associated with a more than 7-fold increased risk, but the confidence interval was wide (OR=7.84, 95% CI=1.66–37.0). The associations with parity, oral contraceptive use, tubal ligation, endometriosis, and talc use in African Americans are all in agreement with the risks found in non-Hispanic Whites, although none were statistically significant. The adjusted ORs for the three racial/ethnic groups combined are also shown in Table 3.

The first three columns of Table 4 show that these six factors together accounted for 57.9% of IEOCs in non-Hispanic Whites compared with 56.1% in Hispanics and 53.8% in African Americans based on the race/ethnicity-adjusted OR estimates shown in Table 3 (last column). The PAR% due to ‘no tubal ligation’ was large in all three racial/ethnic groups, ranging from 27.5% to 31.0%, followed by ‘no oral contraceptive use’ (ranging from 15.9% to 22.2%), and talc use (ranging from 12.2% to 15.1%). The PAR% for nulliparity was 8.9% in non-Hispanic Whites, but lower in Hispanics (5.7%) and African Americans (5.5%). The PAR%s for endometriosis (ranging from 2.0% to 4.0%) and family history of ovarian cancer (ranging from 2.7% to 3.9%) were more modest. The large ‘no tubal ligation’ PAR% is due to relatively high prevalence in the IEOC patients (Table 2, bottom); it was 90.6% in non-Hispanic Whites, 83.8% in Hispanics, and 80.5% in African Americans, so that a shift to the low-risk category, *i.e.*, having a tubal ligation, will have a substantial impact. In contrast, the PAR% due to nulliparity is lower because being parous is already highly prevalent; 72.2% in non-Hispanic Whites, 83.6% in African Americans, and 82.1% in Hispanics, so that a shift to the low-risk category will have a lesser impact on the overall disease burden.

The mean number of births among parous IEOC cases was 2.5 in non-Hispanic Whites, 2.8 in African Americans and 3.1 in Hispanics (Table 2, bottom). We repeated the PAR% calculations after categorizing births as 0, 1, 2, 3 and 4+ using the 4+ category as baseline: the associated PAR% values increased as expected but the relationships of the PAR%s by racial/ethnic group were essentially unaltered. Similarly, we categorized oral contraceptive use in finer categories of <1 year, 1–4 years, 5–9 years and 10+ years with little effect on the relationships of the PAR%s by racial/ethnic group (data not shown).

Discussion

With the high mortality and the lack of effective early screening for ovarian cancer, better understanding of preventive risk factors is a priority. The primary motivation for this analysis was to determine whether the six confirmed non-genetic risk factors for IEOC (parity, use of oral contraceptives, tubal ligation, endometriosis, first degree family history of ovarian cancer, use of genital talc) in non-Hispanic Whites are also risk factors in Hispanics and African Americans. The risk patterns associated with these six factors were comparable in the three racial/ethnic groups (Table 3), and the PAR%s for the factors jointly (Table 4) were also very similar.

An additional objective was to determine whether these six risk factors jointly could explain the 29% and 15% lower incidence of ovarian cancer in African Americans and Hispanics, respectively, compared to non-Hispanic Whites. The incidence of ovarian cancer as reported by SEER, and other cancer registries, is calculated by considering all women in the denominator (population at risk) without removing those who have had a bilateral oophorectomy and are not at risk. Thus, estimates of racial/ethnic differences in IEOC based on SEER data can be 'improved' by accounting for the racial/ethnic differences in the prevalence of bilateral oophorectomy.

While Lowder *et al*. (12) in their analysis of oophorectomy rates in women undergoing a hysterectomy in the National Hospital Discharge Survey covering the period 1979–2004, found that the proportion was approximately 40% and did not differ by racial/ethnic group; Jamison *et al*. (13) in their analysis of hysterectomy prevalence in women over age 50 in the Behavioral Risk Factor Surveillance System covering the years 1992–2008 found that the rate of hysterectomy was clearly higher in African-American women (47%) than in non-Hispanic Whites (41%) and lower still in Hispanic women (36%). Using figures from these two studies in Formula (A) (see Statistical Analysis section of the Methods section) to adjust incidence rates for the proportion of women with a history of oophorectomy, we estimate that the observed 29% lower incidence rate in African Americans compared to non-Hispanic Whites based on SEER data would be adjusted to 27% [$= 1 - 0.71 \times (1 - 0.41 \times 0.4)/(1 - 0.47 \times 0.4)$]. The PAR% of non-Hispanic Whites was slightly higher at 57.8% than the PAR % in African Americans at 53.8% (Table 4); taking this into account, by use of Formula (B) (see Statistical Analysis section of the Methods section), reduced the difference in incidence between the two groups further from the adjusted 27% to 20%. Overall, taking into account the correction in the population at risk (denominator) and the PAR%, the difference in the African-American to non-Hispanic White incidence rates was reduced by 31% (1–20%/29%). Given that hysterectomy rates are lower in Hispanics compared to non-Hispanic Whites, Hispanics would be at even lower relative risk than what is observed in SEER; the 15% lower incidence rate in Hispanics compared to non-Hispanic Whites would increase to 17% when using the correct at-risk denominator. The PAR% difference will change the difference slightly less in Hispanics compared to non-Hispanic Whites from 17% to 13%. When taking into consideration the correct population at risk and the PAR%, the difference in incidence rates between Hispanics and non-Hispanic Whites is reduced by 13% (1–13%/15%). Thus this type of analysis suggests that further investigations are needed to identify

other risk factors that may explain the remaining differences in IEOC rates between these three racial/ethnic groups.

Strengths of this study include the ability to evaluate the relative comparability in the effect of several well-established risk factors in non-Hispanics Whites, Hispanics and African Americans. Our results on Hispanics fill a knowledge gap, as this is the first study to examine etiologic risk factors for ovarian cancer in this growing minority population in the US. Identical questionnaires and protocols were used in these four studies. Although information on these six factors was based on self-report, there is no evidence of systematic misclassification bias as the direction of racial/ethnic differences in the prevalence of tubal ligation, use of oral contraceptives, and endometriosis are consistent with other studies (6, 14–16). However, these results must be considered with caution as we were limited in that the sample sizes of Hispanics and African Americans were modest and we investigated only the six factors that are confirmed, noncontroversial, showing strong associations with all invasive ovarian cancers in non-Hispanic Whites. The modest sample sizes precluded us from conducting analyses separately by histologic type. The response rate for the three racial/ethnic groups was also modest, but not unlike the response rate for other case-control studies on ovarian cancer.

The comparable risk factor associations in IEOC in African Americans, Hispanics, and non-Hispanic Whites contrast sharply with the more disparate risk factor patterns in breast cancer by race/ethnicity. A number of factors that are known to affect breast cancer risk in non-Hispanic Whites do not appear to influence risk in African Americans and these differences cannot be explained by different prevalence of estrogen receptor/progesterone receptor positive breast tumors between the two groups (17–21). Breast cancer risk factors also appeared to differ profoundly between Hispanics and non-Hispanic Whites in one of the few studies with comparable data on both race/ethnic groups (15). Given the more comparable risk factor patterns in IEOC for non-Hispanic Whites, Hispanics, and African Americans, devising strategies to lessen the burden of IEOC will be applicable to all groups.

Summary

Results from these population-based case-control studies suggest that the six well-established risk factors for IEOC accounted for about 60% of ovarian cancer risk in non-Hispanic Whites, Hispanics and African Americans. There were differences in the prevalence of these factors in the different racial/ethnic groups, and the 27% lower incidence of ovarian cancer in African Americans compared to non-Hispanic Whites was reduced to 20% when these differences were adjusted for, but adjustment for these differences in prevalence accounted for only a very small amount of the lower incidence rate in Hispanics.

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Table 1

Tumor characteristics of invasive ovarian cancer in non-Hispanic Whites, Hispanics, and African Americans: Los Angeles County Ovarian Cancer Study

	non-Hispanic Whites N=1265	Hispanics N=308	African Americans N=128
Age			
<30	12 (0.9%)	5 (1.6%)	1 (0.8%)
30–34	14 (1.1%)	11 (3.6%)	2 (1.6%)
35–39	33 (2.6%)	10 (3.2%)	3 (2.3%)
40–44	58 (4.6%)	31 (10.1%)	13 (10.2%)
45–49	144 (11.4%)	36 (11.7%)	17 (13.3%)
50–54	194 (15.3%)	60 (19.5%)	25 (19.5%)
55–59	186 (14.7%)	46 (14.9%)	18 (14.1%)
60–64	193 (15.3%)	43 (14.0%)	24 (18.8%)
65–69	179 (14.2%)	29 (9.4%)	15 (11.7%)
70–74	160 (12.6%)	26 (7.5%)	8 (6.3%)
75–79	92 (7.3%)	14 (4.5%)	2 (1.6%)
Histology			
Serous	721 (57.0%)	179 (58.1%)	71 (55.5%)
Mucinous	85 (6.7%)	26 (8.4%)	12 (9.4%)
Endometrioid	153 (12.1%)	34 (11.0%)	14 (10.9%)
Clear-cell	75 (5.9%)	14 (4.5%)	4 (3.1%)
Epithelial	40 (3.2%)	13 (4.2%)	2 (1.6.%)
Undifferentiated/poorly	53 (4.2%)	12 (3.9%)	10 (7.8%)
Other	131 (10.4%)	28 (9.1%)	14 (10.9%)
Not known	7 (0.6%)	2 (0.6%)	1 (0.8%)
P_{3df} *ab*		0.54	0.40
Stage			
Localized	216 (17.1%)	58 (18.8%)	30 (23.4%)
Regional	170 (13.4%)	49 (15.9%)	12 (9.4%)
Distant	853 (67.4%)	197 (64.0%)	83 (64.8%)
Not known	26 (2.1%)	4 (1.3%)	3 (2.3%)
P_{2df} *ac*		0.38	0.12
Differentiation			
Well	119 (9.4%)	29 (9.4%)	9 (7.0%)
Mod well	235 (18.6%)	53 (17.2%)	28 (21.9%)
Poorly	502 (39.7%)	119 (38.6%)	46 (35.9%)
Undifferentiated	170 (13.4%)	33 (10.7%)	16 (12.5%)
Not known	239 (18.9%)	74 (24.0%)	29 (22.7%)
P_{3df} *ab*		0.81	0.63

a P value comparing non-Hispanic Whites to each of the other two groups separately.

[b] P value based on cases of serous, mucinous, endometrioid and clear-cell histology only.

[c] P value excluding cases with not known histology or stage of cancer at diagnosis.

Table 2

Prevalence of risk factors in non-Hispanic White, Hispanic and African-American control women (top) and ovarian cancer cases (bottom)

	Controls[a]					
Factors	**Non-Hispanic Whites**	**Hispanics**	**African Americans**	**P1[b]**	**P2[c]**	**P3[d]**
% Nulliparous	23.7%	13.7%	16.8%	<0.001	0.076	0.45
Mean # births among parous (SD)	2.5 (1.3)	3.0 (1.7)	2.7 (1.5)	<0.001	0.03	0.15
% Oral contraceptive use (no/< 1 year)	41.5%	54.7%	47.6%	<0.001	0.19	0.17
Mean # months of OC use among users (SD)	95.9 (74.9)	81.0 (67.0)	93.1 (74.2)	0.014	0.75	0.21
% No tubal ligation	85.9%	73.7%	69.2%	<0.001	<0.001	0.36
% Endometriosis	7.5%	3.4%	5.6%	0.006	0.50	0.38
% Family history of ovarian cancer	2.5%	3.4%	2.8%	0.37	0.98	0.93
% Talc use ≥1 year	30.4%	28.9%	44.1%	0.61	0.0001	0.002
Mean # years of talc use among users (SD)	23.9 (17.4)	21.3 (16.7)	22.9 (17.0)	0.15	0.67	0.55
	Case[d]					
% Nulliparous	27.8%	17.9%	16.4%	<0.001	0.007	0.82
Mean # births among parous (SD)	2.5 (1.2)	3.1 (1.7)	2.8 (1.6)	<0.001	0.003	0.24
% Oral contraceptive use (no/< 1 year)	57.4%	69.8%	50.0%	<0.001	0.13	<0.001
Mean # months of OC use among users (SD)	73.4 (61.1)	59.8 (53.1)	75.7 (66.7)	0.044	0.75	0.10
% No tubal ligation	90.6%	83.8%	80.5%	<0.001	<0.001	0.49
% Endometriosis	11.1%	5.5%	9.4%	0.005	0.66	0.21
% Family history of ovarian cancer	5.1%	4.9%	7.0%	0.96	0.48	0.50
% Talc use ≥1 year	41.2%	38.6%	47.7%	0.45	0.19	0.10
Mean # years of talc use among users (SD)	27.5 (18.4)	21.6 (16.9)	26.6 (18.2)	0.001	0.71	0.069

Abbreviation: SD, standard deviation

[a] Controls included: 1,868 Non-Hispanic Whites, 380 Hispanics, and 143 African Americans

[b] P_{1df} for differences between non-Hispanic Whites and Hispanic controls (top)/ P_{1df} for differences between non-Hispanic Whites and Hispanic cases (bottom)

[c] P_{1df} for differences between non-Hispanic whites and African American controls (top)/ P_{1df} for differences between non-Hispanic whites and African American cases (bottom)

[d] P_{1df} for differences between Hispanic and African American controls (top)/P_{1df} for differences between Hispanic and African American cases (bottom)

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[e] Cases included: 1,265 Non-Hispanic Whites, 308 Hispanics, and 128 African Americans

Table 3

Mutually adjusted odds ratios[a] for invasive ovarian cancer in Los Angeles County non-Hispanic Whites, Hispanics, and African Americans

	non-Hispanic Whites (1,265/1,868)		Hispanics (308/380)		African Americans (128/143)		All (1701/2391)	
	ca/co	**OR (95% CI)**	**ca/co**	**OR (95% CI)**	**ca/co**	**OR (95% CI)**	**ca/co**	**OR (95% CI)**
Livebirths								
Yes	913/1426	1.00	253/328	1.00	107/119	1.00	1273/1873	1.00
No	352/442	1.43 (1.19–1.73)	55/52	2.22 (1.28–3.84)	21/24	1.42 (0.54–3.75)	428/518	1.47 (1.24–1.75)
Per birth		0.70 (0.58–0.84)		0.45 (0.26–0.78)		0.70 (0.27–1.86)		0.68 (0.57–0.81)
Oral Contraceptive (OC)								
Yes	539/1092	1.00	93/172	1.00	64/75	1.00	696/1339	1.00
None/<1 yr	726/776	1.55 (1.31–1.84)	215/208	1.29 (0.87–1.92)	64/68	1.30 (0.64–2.63)	1005/1052	1.47 (1.26–1.70)
Per 5 yrs OC		0.64 (0.54–0.76)		0.77 (0.52–1.15)		0.77 (0.38–1.55)		0.68 (0.59–0.79)
Tubal ligation								
Yes	119/263	1.00	50/100	1.00	25/44	1.00	194/407	1.00
No	1146/1605	1.41 (1.10–1.81)	258/280	1.71 (1.07–2.74)	103/99	1.65 (0.73–3.74)	1507/1984	1.52 (1.23–1.87)
Endometriosis								
No	1125/1728	1.00	291/367	1.00	116/135	1.00	1532/2230	1.00
Yes	140/140	1.51 (1.15–1.98)	17/13	2.21 (0.89–5.48)	12/8	1.74 (0.45–6.74)	169/161	1.56 (1.21–2.00)
First degree family history of ovarian cancer								
No	1200/1822	1.00	293/367	1.00	119/139	1.00	1612/2328	1.00
Yes	65/46	2.12 (1.40–3.21)	15/13	2.38 (0.94–6.01)	9/4	7.84 (1.66–37.0)	89/63	2.26 (1.58–3.25)
Genital talc use								
None/<1 yr	744/1300	1.00	189/270	1.00	67/80	1.00	1000/1650	1.00
Yes	521/568	1.41 (1.21–1.67)	119/110	1.77 (1.20–2.62)	61/63	1.56 (0.80–3.04)	701/741	1.46 (1.27–1.69)
Per 5 yrs talc		1.14 (1.08–1.21)		1.18 (1.02–1.36)		1.15 (0.90–1.47)		1.14 (1.09–1.20)

[a] Multivariate logistic regression analyses were jointly stratified for race/ethnicity, age group (<30, five year age groups to age 79), interviewer and study, and adjusted for menopausal status, age at menarche, hormone therapy use, body mass index, income, education, and each of the six factors shown

Table 4

Ovarian cancer population attributable risk percentages (PAR%s) in Los Angeles County non-Hispanic Whites, Hispanics, and African Americans[a]

	non-Hispanic Whites	Hispanics	African Americans
	Using race-adjusted ORs[a]		
	PAR% [b]	PAR% [b]	PAR% [b]
No livebirth	8.9% 5.3%–11.9%	5.7% 3.4%–7.6%	5.3% 3.1% – 7.0%
No/<1 yr oral contraceptives	18.3% 12.0%–23.7%	22.2% 14.5%–28.8%	15.9% 10.4% – 20.7%
No tubal ligation	31.0% 17.2%–42.3%	28.7% 15.9%–39.1%	27.5% 15.2% – 37.5%
Yes endometriosis	4.0% 2.0%–5.5%	2.0% 1.0%–2.8%	3.4% 1.7% – 4.7%
Yes family history ovarian cancer	2.9% 1.9%–3.6%	2.7% 1.8%–3.4%	3.9% 2.6% – 4.9%
Yes/≥1 yr talc use	13.0% 8.7%–16.8%	12.2% 8.1%–15.8%	15.1% 10.0% – 19.5%
3 factors (no tubal ligation, no/<1 yr oral contraceptives, yes/≥1 yr talc use)	50.8% 39.7%–59.5%	51.2% 40.8%–59.3%	47.9% 37.8%–55.8%
All 6 factors	57.9% 48.7%–65.3%	56.1% 46.8%–63.3%	53.8% 45.0% – 60.7%

[a] Using the all race/ethnicity adjusted ORs from Table 3.

[b] The PARs were mutually adjusted for the variables shown in this table as well as for race/ethnicity, age group (<30, five year age groups to age 79), interviewer and study, and adjusted for menopausal status, age at menarche, hormone therapy use, body mass index, income, and education.